

A RECONSIDERATION OF SIDOPSIS RYDBERG AND NOTES ON MALVASTRUM A. GRAY (MALVACEAE)

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The monotypic genus *Sidopsis* was based by Rydberg (1932) on *Sida hispida* Pursh (1814). Although Rydberg erroneously cited Elliott (1822) as the author of *S. hispida*, Elliott, himself, clearly attributed the species to Pursh, leaving no doubt as to the correct authority of the binomial. Similarly, there is no doubt that Rydberg intended his genus to apply to a small, yellow-flowered annual of the midwestern and eastern United States, generally recognized either as *Malvastrum angustum* Gray (1849) or as *Sphaeralcea angusta* (Gray) Fern. (1939), for he cited Gray's name in synonymy, and his description certainly applies to that species. Though Rydberg's intention is clear, the fact that he chose to base his genus on *S. hispida* creates a problem, for Pursh's species has not been typified nor has there been agreement on its identity, and consequently the status of *Sidopsis* is questionable. It is doubtful whether this problem will ever be solved to everyone's satisfaction, since type material apparently has not been preserved; however, taking all facets of the problem into consideration, it is possible to arrive at a reasonable determination of *S. hispida*. Irrespective of the nomenclatural disposition of *S. hispida* and in turn that of *Sidopsis*, there is the question of whether or not the species to which Rydberg applied his name deserves generic recognition.

Pursh described *S. hispida* in the following manner: "*S. hispidopilosa*; foliis lanceolatis serratis, pedunculis solitariis axillaribus longitudine petiolorum, calyce exteriori filiformi. In sandy plains of Georgia. *Lyon* v.s. in *Herb. Lyon*. Flowers yellow." Consideration of Pursh's entry involves several factors, the first being its applicability to Malvaceae of the eastern United States, for though both the collector and the site of the type collection have been

questioned, there seems little doubt that the collection must have been taken from the eastern or at most midwestern regions of the country. The comparison of Pursh's description with that which I have drawn from collections of *M. angustum* reveals no serious discrepancies. *Malvastrum angustum* is copiously but not conspicuously pubescent with rather coarse, stiff, mostly appressed hairs. If the term "pilose" is taken in the sense of denoting open-hairiness, as it may be, then *M. angustum* may be characterized as hispid-pilose. The leaves of *M. angustum* are often lanceolate although they tend, in general, to be linear to narrowly oblong-lanceolate. Likewise they are serrate, remotely so, with only four to six serrations on either margin. The flowers are solitary in the axils, but, as in many Malvaceae, they often appear glomerate on greatly reduced axillary branches. The presence or absence of these axillary branchlets may only be a reflection of the age and/or vigor of the plants and not an indication of genetic differences. In any event, collections of *M. angustum* have often been made that have only solitary, primary axillary flowers. The pedicels of this species, however, are usually shorter than, rather than equal to, the subtending petiole — at least at anthesis — but in fruit they often exceed the petiole slightly. The involucral bracts are filiform and the corollas are yellow. Finally, Pursh described *S. hispida* as a perennial, whereas, *M. angustum* is certainly an annual, but the distinction between annual and perennial duration is often not easily made, and the rather ligneous character of the lower stems may have been misleading.

Besides the description itself, a further characterization of *S. hispida* is implied by Pursh's inclusion of it in the genus *Sida* L. rather than in *Malva* L. During Pursh's time these genera were distinguished primarily by the presence or absence of involucral bracts, these being present in *Malva* and absent in *Sida*. Even today this is a valid difference with the few exceptions which for other reasons are not pertinent to this discussion. Pursh must have been aware of this difference; he cited, as the basis of his genera, Schreber's edition of *Genera Plantarum* (1791) where this

distinction was clearly made. It can only be assumed that in aspect Pursh's plant was so *Sida*-like that he chose to emphasize this feature rather than the presence of involucre bracts in assigning it to a genus. This is further brought out by Pursh's placement of *S. hispida* between *S. spinosa* L. and *S. rhombifolia* L., species which may be considered representative of the mean expression of the genus.

Among the North American species of Malvaceae, only those of the genus *Malvastrum* Gray (1849), as I shall define it below, exhibit both this *Sida*-like aspect and fit Pursh's description in other respects. It is from among these that *S. hispida* must be sought. Besides *M. angustum*, five other species of *Malvastrum* occur in the United States. Two of these, *M. aurantiacum* (Scheele) Walp. and *M. bicuspidatum* (S. Wats.) Rose, are found only west of the Mississippi and probably do not need to be considered. Nevertheless, they may also be eliminated on morphological grounds: both have broadly ovate leaves, and the former has stalked, deltoid-ovate involucre bracts, while the latter has dense, canescent pubescence. The other three species are confined to southern regions of Florida and Texas but may occasionally be found in coastal regions of the Gulf Coast. They occur south of the probable collection site of *S. hispida*, but, because of their weedy nature, it is not inconceivable that sometimes they might be carried further north. The leaves of all three species are predominantly ovate to broadly ovate and only rarely, in the inflorescence, might they be termed lanceolate. One, *M. americanum* (L.) Torr., has in addition dense, elongate, spicate inflorescences which are at variance with Pursh's characterization. The other two species, *M. coromandelianum* (L.) Garcke and *M. corchorifolium* (Desr.) Britton ex Small, although amply distinct from *M. angustum*, can be distinguished from it with respect to Pursh's description only on the basis of the leaf conformation. It seems unlikely, however, that Pursh would have redescribed *M. coromandelianum*, for that species was already well known (as *Malva tricuspidata* Aiton). In any event, a consideration of the problem on a purely morphological basis demonstrates that *S. hispida* corre-

sponds more closely to *M. angustum* than to any other species of *Malvastrum*.

Other questions pertinent to the problem of identity of *S. hispida* concern the geographical area of the type collection and the identity of the collector. Both have been questioned (Kearney, 1950; Ewan and Ewan, 1963), largely because no species answering the description of *S. hispida* has been collected in Georgia. I have not seen any specimens nor am I aware of any reports of *M. angustum*, *M. coromandelianum*, or *M. corchorifolium* from either the Carolinas or Georgia. Further, Professor Wilbur H. Duncan of the University of Georgia has informed me that he has no record of any of these species from Georgia. It would appear, whether or not *S. hispida* and *M. angustum* are actually synonymous, that *S. hispida* was not collected in Georgia, at least as it is presently bounded. If they are synonymous, then it is also unlikely that the collection was made in "sandy plains," for *M. angustum* is primarily adapted to dry, limestone barrens. Ewan and Ewan (1963), accepting *S. hispida* and *M. angustum* as the same, suggested that Aloysius Enslen and not John Lyon was responsible for the type collection. Enslen's collections, taken through Georgia and lower Louisiana, were thought more likely to include *S. hispida* than those of Lyon. But the Enslen herbarium in the Naturhistorisches Museum, Vienna, does not include any specimens of *S. hispida*, according to the information kindly supplied to me by Mr. Kurt Fitz of that institution, nor are any species of *Sida* included in a handwritten catalogue of 1822 enumerating the Enslen collections.

Perusal of John Lyon's Journal (Ewan and Ewan, 1963) shows that he had the opportunity to collect *M. angustum*, and there is therefore, no compelling reason to credit the collection to another. In the summer of 1803 Lyon crossed the Chattahoochee River near what is now Columbus, Georgia, and journeyed westward to Tuckaubatchee on the Tallapoosa River. This locality is now in Alabama but in 1803 was still part of Georgia. These travels took Lyon just south of Tallapoosa County where Mohr (1901) reported a

collection of *M. angustum* taken by E. A. Smith in August 1873 from the central pine belt. Lyon, himself, reported of his travels on August 20th, the day before reaching Tuckabatchee, that he "proceeded along a high, dry barren ridge in the forepart of the day." Certainly both the area and the habitat were favorable for a collection of *M. angustum* (and in "Georgia," no less). Perhaps a more likely site for the type collection, however, was in the vicinity of Nashville, Tennessee, an area where *M. angustum* has been collected rather commonly. Lyon visited this region in 1807 and again in 1809 and in both instances had ample opportunity to collect this species. With respect to the only other possibility, *M. coromandelianum*, it is evident that Lyon's travels were entirely to the north of its natural range. Except for the remote probability of Lyon's happening upon a chance introduction, it is impossible for him to have collected it.

The consideration of evidence now available permits one of two choices. Either *S. hispida* may be accepted as the same as *M. angustum*, or it may be treated as a dubious name. Although Gray (1849), probably following Hooker (1834), originally felt that these two names might apply to the same species, he later (1897) changed his mind and excluded *S. hispida* from *M. angustum*. Fernald (1939) likewise rejected the two names as being synonymous, stating, "In view of the complete doubt about the identity of *Sida hispida* Pursh, which antedated Elliott by seven years and which was presumed by the latter author to be his plant [It could not have been, for Elliott clearly had a species of *Sida*.], it is quite unwise to force upon the plant of dry barrens and hills of the Mississippi basin the name of an unidentified plant of Georgia and possibly South Carolina. I am, therefore, retaining for the plant of the Mississippi basin the first name which unquestionably belongs to it. If and when Pursh's type is found and positively identified with *Sphaeralcea angusta* [Fernald made the transfer from *Malvastrum* to *Sphaeralcea* for nomenclatural, not taxonomic, reasons as will be brought out below] Pursh's name will be justified; at present its use would be question-

able." It is unlikely, however, that *Sida hispida* will ever be typified, for Lyon's herbarium apparently has not been preserved and the few extant collections which can be attributed to him do not include this species; thus, there will always be grounds for rejecting *S. hispida* if one is disposed to do so. I feel, however, that the evidence available is strong enough so that one may state with reasonable certainty that *S. hispida* and *M. angustum* have been applied to the same species. If one accepts the premise that the type collection was not made in Georgia proper, and this seems logical in view of the fact that no species answering the description of *S. hispida* is known from that state, then there is no obstacle in accepting these names as synonymous. On a morphological basis they correspond more closely than any of the other possibilities discussed, and the known travels of John Lyon put him in a favorable position to make the type collection. The question then turns to the generic disposition of the species. For reasons which will be summarized below, I prefer to recognize it in *Malvastrum*, as *M. hispidum* (Pursh) Hochreutiner, rather than in *Sidopsis* or some other genus.

In 1849 Gray proposed a number of generic changes in the Malvaceae, among them the establishment of *Malvastrum*, erected largely to provide a clearer distinction between *Sida* and *Malva*. Although Gray was successful in giving both *Sida* and *Malva* more precise definition, his description of *Malvastrum* was vague and the genus rapidly became a repository for diverse elements with little in common except carpels with solitary, ascending ovules, style branches equal in number to the carpels with capitate rather than decurrent stigmas, and, in general, an involucre of three bracts. Even at its inception *Malvastrum* included representatives of at least three genera. Of the eight species enumerated by Gray, the first three, *M. coccineum* (Pursh) Gray, *M. munroanum* (Dougl.) Gray, and *M. grossulariaefolium* (Hook. and Arn.) Gray, belong to *Sphaeralcea* St. Hil.; the fourth, *M. fremontii* Torr. ex Gray, to *Malacothamnus* Greene; and the last, *M. angustum*, if considered distinct, to *Sidopsis*. The remaining three belong

to *Malvastrum* sensu stricto. In subsequent years many species, principally from the Americas, were added, and occasionally from this large complex small genera were segregated, e.g., *Tarasa* Phil., *Urocarpidium* Ulbr., *Mala-cothmanus* Greene, and *Eremalche* Greene. In general, these gained little recognition until Kearney (1935, 1951, 1955) and more particularly Krapovickas (1951, 1954, 1957a, 1957b) were able to show, largely through a correlation of chromosome numbers and morphology, with emphasis on carpel characters, the validity of recognizing additional genera in what had been considered *Malvastrum*. Their redefinition of *Malvastrum* restricted it to about twelve species which, except for the now ubiquitous *M. coromandelianum* and *M. americanum*, are found only in the Americas. I would restrict *Malvastrum* even further and remove from it *M. lacteum* (Ait.) Garcke and *M. subtriflorum* (Lag.) Hemsley. This concept of *Malvastrum* has left many species formerly included in the genus in taxonomic limbo, and this rather considerable residue presents many interesting problems. I am currently preparing a monograph of the South African species previously referred to *Malvastrum*, as well as a short paper giving generic recognition to *M. lacteum* and *M. subtriflorum*. There remain, however, the acaulescent species from the Andes and a miscellaneous assemblage of species, principally from South America, that require individual evaluation.

Even in a restricted sense, however, *Malvastrum* is not free from problems, for it has not been typified properly to preserve its usage. *Malvastrum* was conserved over the South African *Malveopsis* Presl, and the lectotype chosen by Miss Green (1935) was *M. coccineum*. But as I have pointed out above, *M. coccineum* is a *Sphaeralcea*, and therefore, *Malvastrum* is a nomenclatural synonym of *Sphaeralcea* when so typified. It was on this basis and not for taxonomic reasons, that Fernald (1939) transferred *M. angustum* to *Sphaeralcea*, for there is no doubt that *Malvastrum* and *Sphaeralcea* are generically distinct. Nevertheless, if the lectotype is not changed, a new name must be found for those species still referred to *Malvastrum*.

Kearney (1947, 1955) recognized this and suggested that *M. coromandelianum* should be selected as the lectotype. In this conclusion he has been supported by Krapovickas (1957b) and Borssum Waalkes (1960). To my knowledge such a proposal has never been formally submitted to the General Committee, but, for reasons I shall elucidate in a forthcoming note, I doubt that *M. coromandelianum* can be accepted as the lectotype. Fortunately, there is an alternative solution which I believe is acceptable and which will preserve the usage of *Malvastrum*; and I am therefore continuing to use the name. Interestingly, this whole problem would not have arisen if more thought and effort had been given to working out the identity of *Malveopsis*. Having reviewed the pertinent references and available herbarium material, I am convinced that *Malveopsis*, based on *Malva anomala* Link and Otto, may be regarded as a synonym of *Anisodonteia*, Presl, a name I am reviving for those South African species previously referred to *Sphaeralcea*.

Perhaps the most serious handicap in attempting to delimit and to evaluate genera and their relationships within the tribe Malveae is the absence of adequate descriptions at both a specific and generic level. Considering the redefinition of *Malvastrum*, it seems appropriate to include here an adequate working description of the genus before discussing briefly the relationships of the species included in it. I have incorporated in this description data from my description of *M. hispidum*, but, as will be evident from the discussion of this species' relationship to other species of the genus, this does not greatly extend the perimeters of *Malvastrum*.

Malvastrum Gray, Mem. Am. Acar., ser. 2, 4: 21. 1849.

Sidopsis Rydberg, Fl. Pr. Pl. Centr. N. Am. 541. 1932.

Annual or perennial herbs or subshrubs, generally less than 1 (-2.5) m. tall, the branches spreading or erect; variously pubescent, the hairs simple or stellate, often pustular-based and generally with few radiate or appressed arms. Leaf blades mostly 1.5-9 cm. long, linear-lanceolate to oblong, lance- or deltoid-ovate, unlobed or obscurely 3-lobed, acute or sometimes obtuse, crenate to serrate, subcordate, truncate, or cuneate, ventrally plane or with nerves

impressed, glabrate to copiously pubescent, dorsally with nerves generally raised, more densely pubescent; petioles mostly shorter than the blades; stipules 3-9 (-14) mm. long, filiform or subulate (or asymmetrically oblong-ovate), often caducous or drying early. Flowers axillary and/or terminal, solitary, in cymose clusters, or in dense spikes, sometimes conspicuously bracteate, erect at anthesis and in fruit, opening briefly in the late morning or early afternoon. Involucral bracts 3, spreading or appressed, mostly free or only basally adnate to the calyx tube, filiform to narrow-lanceolate or oblanceolate, 3-8 mm. long, but sometimes elliptic-ovate, then 7×3.5 to 10×5 mm. long and broad, or stalked and with an abruptly expanded, deltoid-ovate blade, 4-7 mm. long, up to 4.5 mm. broad. Calyx generally angled or winged in bud, often hispid, 4-7 (-11) mm. long at anthesis, to 10 (-14) mm. long in fruit, often drying brown, scarious, the lobes 2.5×2 to 7×5 mm. long and broad, deltoid to cordate-ovate, acute or acuminate, principal nerves 3; nectaries 5, free, usually obscure. Corollas yellow to orange-yellow, mostly scarcely exceeding the calyx; petals 3×2 to 9×7 (to 15×11) mm. long and broad, obovate, at the apex slightly oblique, shallowly emarginate, narrowed evenly to a non-auriculate base, glabrous except for few spreading hairs along the basal margin or at the union with the staminal column. Staminal column yellowish, included, up to 3 (-6) mm. long, glabrous or puberulent at the base between the petals; filaments terminal or arising over the upper 1 mm. or so, to 1 (-2) mm. long; anthers 5 to ca. 36 (-51), yellowish then reddish after dehiscence. Style branches 5-16, exerted and recurved within the anthers before or at anthesis; stigmas capitate, expanded, papillate. Carpels as many as the style branches, free from one another in a flat whorl about a central columella, each with a single, ascending ovule. Fruit exposed or clasped by the calyx, 3-10 mm. in diameter, reddish-brown or tan, sometimes glabrous but generally with few to many, erect, simple or bifurcate, hispid hairs and often with stellulate pubescence as well; mature carpels varying from ca. 1×1 to 4.5×4.5 mm. long and broad, angular-orbicular to transverse-elliptic in outline, laterally compressed, armed or unarmed, the lateral edge rounded or sharp, sometimes raised in a slight wing or prolonged dorso-apically into ascending, horizontal or deflexed, laterally flattened knobs or spines, the lateral walls often fused ventro-apically and sometimes forming an indehiscent or partially dehiscent erect knob or spine, smooth below or with a raised, transversely radiate pattern of thickenings, the dorsal wall often canaliculate; carpels indehiscent, partially dehiscent along the midvein basally, or completely dehiscent into two free valves, glabrous within, with or without a small ventro-apical endoglossum. Seeds 0.9 to 2.8 mm. long, asymmetrically to nearly symmetrically reniform, glabrous, black or reddish-brown or -black. Chromosome number, $n = 6, 12, 18$.

It is difficult to estimate how many species *Malvastrum* actually comprises, for the species or species-complexes included in it have not been carefully studied. The above description has been drawn principally from notes made during my tenure as a National Science Foundation Postdoctoral Fellow at the British Museum (Natural History) and the Royal Botanic Gardens, Kew. My primary purpose at that time was to attempt to estimate generic variation within the Malvaceae tribe Malveae, and although such a survey naturally involved observations of a great number of species, its orientation was not that of monographic work at a specific level, and therefore was not particularly occupied with delimiting species. On the other hand, such a survey could not help but lead to conclusions concerning the constitution of genera. In the case of *Malvastrum*, it seems that the species, on the basis of morphological comparisons, conveniently fall into four groupings or series.

The largest of these series in terms of apparent number of species, and for this reason perhaps to be considered the modal expression of the genus, includes the following species; *M. coromandelianum* (L.) Garcke [*M. tricuspidatum* (Ait.) Gray], $2n = 24$ (Skovsted, 1935, 1941, Krapovickas 1949, 1951, 1954, Roy & Sinha 1961); *M. corchorifolium* (Desr.) Britton ex Small [*M. rugelii* S. Wat.]; *M. americanum* (L.) Torr. [*M. spicatum* (L.) Gray], $2n = 24$ (Skovsted, 1935, 1941, Krapovickas, 1951, 1954); *M. interruptum* K. Schumann, $2n = 36$ (Krapovickas, 1954); and *M. spiciflorum* (Hassler) Krapov., $2n = 12$ (Krapovickas, 1954). Morphological differences within this series are associated primarily with the character of the inflorescence, pubescence, and size and ornamentation of the carpels, but within this grouping there is a continuity of expression largely expressed in the modal values given in the generic description. *M. corchorifolium* probably should not be recognized at a specific level, for it differs from *M. coromandelianum* only in having carpels that are spineless or essentially so. Throughout the Caribbean islands, numerous forms occur with varying spine development so that any line drawn between the two species is quite arbitrary. A

difference of similar magnitude separates *M. americanum* and the Argentinian *M. interruptum*. In the former the spikes are naked and the flowers are subtended by bifid bracts, whereas in *M. interruptum* the inflorescences are leafy and the bracts are in pairs. Cytologically, however, these two species are distinct, *M. americanum* being tetraploid and *M. interruptum* hexaploid.

Within this series the only diploid species of the genus has been reported: *M. spiciflorum* endemic to Argentina. Except for the fact that chromosome numbers of all species of the genus are apparently based on the number 6, nothing is actually known of the cytological relationships among them, though it may be predicted that some genomic duplication must exist. On morphological grounds there seem to be no stronger correlations between species at a given ploidy level than between species at different levels, and certainly it would be unwarranted at this time to speculate on phylogenetic relationships on the basis of the few counts available. Nevertheless, it seems improbable that the diploid *M. spiciflorum*, notable for its extremely small, unarmed carpels, reduced number of stamens, and small floral parts, is ancestral to any of the known species.

The other series include species which vary from this modal grouping in a few conspicuous characters, but in no case do they become so extreme as to suggest that further generic segregation might be called for. One of these series comprises the North American (Texas) *M. aurantiacum* (Scheele) Walp. [*M. wrightii* Gray] and the South American (Bolivia, Paraguay, Argentina) *M. amblyphyllum* R. E. Fries, $2n = 24$ (Krapovickas, 1954). These species are distinctive primarily in their large floral parts and fruits. In *M. amblyphyllum* the involucre bracts may be linear-lanceolate but sometimes are elliptic-ovate, whereas in *M. aurantiacum* the bracts are stalked, with an abruptly expanded blade. In both species the bracts nearly equal the calyces, which even in flower are often 10 mm. long. Similarly, the petals are larger and the anthers more numerous. The carpels vary from 3.5-4.5 mm. long and broad, each with two dorso-apical projections and a spinescent and

fused ventral region. The flowers are mostly solitary in the axils, but in *M. amblyphyllum* may reach three in number on reduced axillary branchlets. Despite a rather high degree of similarity in conspicuous characters, it is probable that this series does not represent a natural alliance. In general aspect, particularly in the actual conformation of the carpels, *M. amblyphyllum* seems to tie in with the *M. coromandelianum* series, whereas it is more difficult to relate *M. aurantiacum* to any of the other species in particular.

The third series may be designated the *M. scoparium* series, for this was the first species named in a complex of species or forms running from western North America (Arizona) to Bolivia and Peru and the Galápagos Islands. Besides *M. scoparium* (L'Hér.) Gray, names most commonly encountered which belong to this complex are *M. bicuspidatum* (S. Wats.) Rose, *M. guatemalense* Standl. and Steyererm., *M. scabrum* (Cav.) Gray, *M. depressum* (Benth.) Svenson, *M. dimorphum* J. T. Howell, *M. scoparioides* Ulbr., and *M. guaraniticum* Hassler. It is difficult to suggest where species lines ought to be drawn in this series, but it may not be amiss to suggest that all should be included under *M. scoparium* with the major variants, if they can be shown to have geographical continuity, recognized at a subspecific level. This series of forms has as its unifying characteristic a carpel conformation in which there are two dorso-lateral spines projecting outward in more or less horizontal fashion with a deep acute sinus between them. Ventro-apically there may be no projection or a small to quite prominent awn. Variation in the prominence of the awns or spines and considerable differences in pubescence (for the most part an unreliable taxonomic criterion in the Malveae) as well as some miscellaneous differences, such as the length of the petals or number of flowers in the inflorescence, have formed the basis for recognizing most of the species.

Skovsted (1935) reported for *M. scoparium* a chromosome number of $2n = 24$, but later (1941), for *M. scabrum*, a species of the same complex, reported $2n = 42$. I have examined voucher material of *M. scoparium*, kindly lent by

Dr. Skovsted of the Botanical Museum and Herbarium, Copenhagen, and it is correctly determined. Unfortunately there is no material of *M. scabrum*, but there is little doubt that the identification was erroneous and was probably only that under which the species was received as seed from the botanical garden in Bucharest. Not only is the count at variance with all others reported in the genus, but the illustration of the mitotic complement presented by Skovsted (1941) is at variance with those which he and, later, Krapovickas (1954) have given for other species of *Malvastrum*. Skovsted (1941) also pointed out that species of *Malvastrum* with 24 somatic chromosomes (the only true species of *Malvastrum* which he had) are distinctive cytologically. Not only are the chromosomes distinct in their size and shape, but also they are arranged in irregular but characteristic fashion during mitosis. It is more than likely that in this case "*M. scabrum*" was actually a species of *Malva*. The number $2n = 42$ is common in that genus, and the comparison of illustrated karyotypes shows them to be remarkably similar.

The last series to be considered includes only *M. hispidum*. Rydberg's description of *Sidopsis* in his floristic account of the plains and prairies of central North America was brief and included no discussion of the reason for providing this species with generic recognition. He did note in his description, however, the completely dehiscent nature of the carpels. Kearney (1951) stressed this character, together with the *Sida*-like aspect of the species, to maintain it as generically distinct. *Sidopsis*, however, is not the only genus of Malveae characterized by ascending ovules in uniovulate, completely dehiscent carpels. Others are *Malacothamnus* Greene, *Tarasa* Phil., and *Nototriche* Turcz. The first of these belongs to a phylogenetically distinct alliance (Bates, 1963) including *Phymosia* Desv. and *Iliamna* Greene, with a base chromosome number of $x = 17$; *Tarasa* and *Nototriche* belong to a series of genera including among others *Sphaeralcea* St. Hil., *Urocarpidium* Ulbr., and *Eremalche* Greene, with a base number of $x = 5$. In these generic groupings it is not simply the mode of carpel dehiscence

which delimits genera. Admittedly, the nature of carpel dehiscence is a useful diagnostic feature, but, in fact, these are natural genera differing from one another in many characters of somewhat more subtle nature. It is probable that carpel characters, in general, have been accorded greater importance than they deserve in classification of the Malveae. This certainly has been the case in *Sidopsis*. In carpel characteristics *M. hispidum* differs from other species of the genus only in having a smaller number — 5-6 instead of (7-) 8 (-16) — and complete dehiscence. Variation in carpel numbers is often greater in other related genera, and in *Sida* there is a similar pattern with some species 5-carpellate but most 7- or more-carpellate. Similarly, the mode of carpel dehiscence loses much of its importance in view of the nearly complete dehiscence in *M. americanum*. The carpels of this species dehisce along the midvein from the ventro-basal junction with the columella around the dorsal wall and nearly to the ventro-apical junction. Here, however, dehiscence is stopped by a slight fusion of the valves. In what forms a genus of remarkable uniformity, there seems no justification for emphasizing these slight carpelary differences, (better reflective of specific limits), to maintain *Sidopsis* as distinct from *Malvastrum*.

With the exception of the fruiting characters only the narrow leaves of *M. hispidum* actually broaden the limits of *Malvastrum*, but these correspond to the basic unlobed pattern common to all species. In addition, *M. hispidum* shares with other species particular characteristics, such as the unusual 4-armed hairs of *M. coromandelianum*, or with all species a similar pattern of floral structure and probably floral behavior. Although I have had the opportunity of observing only *M. coromandelianum*, *M. americanum*, and *M. hispidum* in a living state, there is every reason to believe, considering the relationship of style branches and anthers at or just before anthesis, that autogamy is the commonest form of reproduction in the genus. It certainly is in the above three species. In fact, *M. hispidum* is often cleistogamous and the other species may be functionally so, for even before the flower opens, in the late morning or

early afternoon, the pollen has been shed and has coated the stigmas.

Besides a high degree of morphological similarity to other species of *Malvastrum*, *M. hispidum* shares the same base chromosome number. Counts have been made from microsporocytes of bud collections made in Kentucky (*Bates* 2704), Missouri (*Bates* 2688, 2690, 2691), and Kansas (*Bates* 2702). Localities for these collections are listed in the citation of specimens and voucher material is deposited in the L. H. Bailey Hortorium. In all cases, $2n = 36$. At metaphase pairing was complete, and segregation in anaphase 1 showed no abnormalities. This is the second hexaploid reported in *Malvastrum*; however, *M. hispidum* and *M. interruptum* are distinct morphologically and quite likely have been derived independently.

The description of *M. hispidum* following has been drawn primarily from collections made during the summer of 1965. These collections, in themselves, provide a reasonable sampling of the species through most of its range, but have been supplemented by examination of dried specimens from the following herbaria: the L. H. Bailey Hortorium and the Wiegand Herbarium, Cornell University; the Gray Herbarium, Harvard University; the Herbarium, University of Illinois; the Royal Botanic Gardens, Kew; the British Museum (Natural History); and the Botanischer Garten und Institut für Systematische Botanik der Universität Zürich. To those who permitted me to examine material in their care, I wish to express my appreciation.

Malvastrum hispidum (Pursh) Hochr., Ann. Conserv. Jard. Bot. Genève 20: 129. 1917.

Sida hispida Pursh, Fl. Amer. Sept. 452. 1814.

Malvastrum angustum Gray, Mem. Am. Acad., ser. 2, 4: 22. 1849.

Malva perpusilla Nutt. ex Gray, loc. cit., pro syn.

Malveopsis hispida (Pursh) Kuntze, Rev. Gen. Pl. 1: 72. 1891.

Sidopsis hispida (Pursh) Rydb., Fl. Pr. Pl. Centr. N. Am. 541. 1932.

Sphaeralcea angusta (Gray) Fern., Rhodora. 41: 435. 1939.

Erect, annual herbs 1.5-4.5 (-6) dm. tall, simple or branched, the branches ascending, arising from near but not at the base, progres-

sively shorter distally, rarely exceeding the leader; stems and branches slender, terete, greenish distally, generally reddish-brown proximally, copiously pubescent with appressed, mostly 4- (rarely 6-) armed hairs, the arms to 0.75 (-1.2) mm. long, generally in sub-parallel pairs oriented parallel to the long-axis of stems and branches. Leaf blades yellowish-green, up to 5.5 cm. long \times 1.3 cm. broad, linear to narrow-oblong or lanceolate, the apex acute or obscurely mucronate, the base cuneate to narrow-obtuse, the margins usually with 4-6 pairs of evenly spaced, bristle-tipped serrations, rarely sub-entire, the nerves 1-3 from the base, the surfaces plane, mostly inconspicuously appressed-pubescent above and below, the hairs 4-armed above, 4-7-armed below, simple to 4-armed marginally; petioles generally less than $\frac{1}{3}$ the length of the blades; stipules spreading, 2-7 mm. long, narrow-subulate to filiform, simple-ciliate, drying and turning brownish early. Flowers erect at anthesis and in fruit, solitary in the axils but sometimes glomerate, especially distally, by the reduction in internode length; pedicels erect, mostly less than 10 mm. long at anthesis, to 17 mm. long and finally patent in fruit. Involucral bracts 3, free, (2.6-) 4-6.8 mm. long, filiform, linear, or very narrow-subulate, mostly thickened with a slight groove ventrally, dorsally hispid with simple to 2- or 4-armed hairs, in fruit becoming brownish, reflexed. Calyx at anthesis (2.8-) 4.3-7.2 mm. long, in fruit 9-12.5 mm. long, copiously hispid with sessile, appressed, 4-6-armed hairs, the lobes in bud through fruit plicate-winged at the margins, overhanging the whitish tube, (1.2-) 2.8-5.8 mm. long \times (1-) 2-5.8 mm. broad at anthesis, 8-10 mm. long \times 8-12 mm. broad in fruit, (narrowly to) broadly cordate-ovate, abruptly acuminate to subcuspidate, marginally simple- or bifurcate-ciliate, puberulent within, the tube glabrous within with 5 obscure nectaries at the base opposite the lobes; drying brown and scarious. Corolla included within or slightly exceeding the calyx, the petals yellow, 2.8 \times 1.5 to 4.5 \times 3.2 mm. long and broad, obovate, obliquely shallow-emarginate apically, gradually cuneately narrowed to a non-auriculate base, but sometimes with a few simple, hispid hairs along the basal margins. Staminal column shorter than the petals, ca. 2-3 mm. long, yellow, glabrous or glabrate, the filaments to 0.5 mm. long, terminal; anthers 8-13 (-16), bright yellow. Ovary composed of 5 (-6) free carpels in a flat whorl, each with a single ascending ovule. Style to 4 mm. long, glabrous, the branches as many as the carpels (occasionally a branch may be bifurcate at the apex), recurved within the anthers before or at anthesis; stigmas capitate, papillate, yellow. Fruit 5.6-7.6 mm. in diam. in a star-like whorl with broad, deep sinuses between adjacent carpels. all free surfaces copiously pubescent with sessile, erect, simple or bifurcate hairs, often with a reddish base, these at the apex up to 1 mm. long; carpels yellowish- to reddish-brown, 2.6 \times 2.6 to 3 \times 3.5 mm. long and broad, more or less orbicular but the base often truncate, laterally compressed with rounded lateral edges, plane without

lateral venation; midvein present; smooth within, lacking an endoglossum; loculicidally dehiscent, from the ventro-apical and -basal edge to the dorsal edge, into two free valves. Seeds 2.1×2 to 2.5×2.5 mm. long and broad, rounded and nearly symmetrically reniform, glabrous, reddish-black or sometimes grayish. Chromosome number, $n = 18$.

TYPE. In the absence of authentic Lyon material, Pursh's description (1814) may serve as type.

DISTRIBUTION. East of the Mississippi *M. hispidum* occurs in Kentucky, Tennessee, and Illinois and has been reported from Tallapoosa County, Alabama (Mohr, 1901). In Kentucky it has been collected just southwest of Lexington, and in Tennessee seems to be confined to the area about Nashville. It has not been collected since before the turn of the century in Illinois (Jones & Fuller, 1955) but at that time was found in northern regions of the state about Ottawa and Rock Island. To the west of the Mississippi the species is found in its greatest concentration in Missouri and eastern and central Kansas. To the north it reaches Iowa, but I have seen records only for the immediate vicinity of the Mississippi, and although it is reported from Nebraska (Steyermark, 1963, among others) I have not seen any collections actually made there. To the south of Missouri it may be found in the Ozarks of northern Arkansas, and it has been collected south of Oklahoma City, Oklahoma. This latter area is just to the north of the Red River where Nuttall is reported by Gray (1849) to have collected the species.

Throughout its range *M. hispidum* is exceeding local. Although populations may consist of dense stands, most of those which I have seen could be included in a few square meters. The largest population observed, (Bates 2672) which in fact consisted of a number of sub-populations, could be bounded by a square with sides about twenty meters. With the exception of my collection (2700) in southeastern Kansas where I found this species growing in clay-loam, all were taken in areas about limestone outcrops, either in crevices of the outcrops themselves or in soils (often cherty) overlying them. It seems that this type of habitat is most common to the species, although Steyermark (1963) reported it may occasionally be found in "open al-

luvial ground in valleys, and along gravel bars." It is probable that *M. hispidum* is only adventive in such habitats.

REPRESENTATIVE SPECIMENS. KENTUCKY. Jessamine Co.: High Bridge, dry limestone soil along roadsides and waste fields, 17 Aug. 1942, *McFarland 13* (BH, CU, GH); Common along roadside, Kentucky highway 33, 0.3 mile e. of United States highway 68, 26 Aug. 1965, *Bates 2705* (BH). Woodford Co.: Road's edge, Kentucky highway 33, 0.8 mile west of Woodford-Jessamine county line, 26 Aug. 1965, *Bates 2704* (BH). TENNESSEE: Davidson Co.: Vicinity of Nashville, in August, *Gattinger* (BM, CU, GH, K); Cedar glades near La Vergne, 27 July 1938, *Svenson 9362* (GH). Rutherford Co.: Railroad track, La Vergne, July 1894, *Ruth* (ILL); Dry cedar glade, La Vergne, 20 Aug. 1922, *Svenson 202a*. (GH). Wilson Co.: Limestone barrens, Lebanon, 30 Aug. 1947, *Sargent 93* (GH). ILLINOIS: La Salle Co.: Barrens, Ottawa, 29 Sept. 1882, *Seymour* (ILL), Sept. 1881, *Boltwood* (GH). Rock Island Co.: Growing abundantly among the debris of an old limestone quarry near Rock Island Arsenal, in 1866, *Parry* (GH), in 1862, (BH). IOWA: Muscatine Co.: Banks of the Mississippi River near Davenport, *Barnes* (ILL). MISSOURI: Callaway Co.: Common in loamy soil of limestone outcrop, county highway AA, ca. 1.0 mile e. of junction with United States highway 54, 6 miles n. of Jefferson City, 22 Aug. 1965, *Bates 2688* (BH). Greene Co.: Dorchester near Springfield, 7 Sept. 1887, *Blankenship* (CU). Jasper Co.: Locally abundant in limestone barrens near Webb City, 25 Sept. 1920, *Palmer 19155* (GH); Rocky barrens, Webb City, 6 Aug. 1920, *Bush 9068* (GH). Jackson Co.: Common in barrens, Independence, 6 July 1900, *Bush 768* (K); Rocky places, Lee's Summit, 14 Aug. 1898, *Mackensie 323* (GH), 13 Sept. 1927, *Bush 11550A* (K, Z); Greenwood barrens, 30 Aug. 1905, *Bush 3285* (GH); Rare in crevices of limestone, road cut, Missouri highway 7, 0.8 mile n. of junction with United States highway 50, 22 August 1965, *Bates 2690* (BH); Locally common in loamy soil of limestone ridge, road cut, Missouri highway 150, ca. 1.3 miles e. of Greenwood, 22 Aug. 1965, *Bates 2691* (BH). Lincoln Co.: Cuivre River State Park, common in crevices of limestone outcrop, Missouri highway 147, 0.3 mile n. of junction with Missouri highway 47, 21 Aug. 1965, *Bates 2672* (BH); Cuivre River State Park, banks and flats above dry limestone creek bed, below Missouri highway 147, 0.3 mile n. of junction with Missouri highway 47, 21 Aug. 1965, *Bates 2686* (BH). St. Louis Co.: Stony hills, *Eggert* (ILL); St. Louis, in 1832, *Drummond* (lectotype *Malvastrum angustum* Gray, GH; isotypes BM, K); St. Louis, *Englemann* (GH, K). ARKANSAS: Boone Co.: Harrison, rocky hillsides, 24 Oct. 1914, *Palmer 6910* (CU). KANSAS: Bourbon Co.: 7 miles s. of Uniontown, 20 Sept. 1937, *Horr & Franklin E180* (GH, ILL); Rare along roadside in clay-loam, Kansas, highway 3, just s. of Petersburg, 24 Aug. 1965, *Bates 2700* (BH); Locally

common in limestone soils, Kansas highways 7, 39, 5 miles w. of Hiatville, 24 Aug. 1965, *Bates 2702* (BH). Douglas Co.: Without locality, 16 Aug. 1895, *Hitchcock* (GH). Reno Co.: Without locality, July 1891, *Carlton* (ILL). Riley Co.: Without locality, stony hills, 27 Aug. 1895, *Norton* (GH). OKLAHOMA: Johnston Co.: Tishomingo, granite barrens, 10 Sept. 1914, *Palmer 6491* (CU).

BAILEY HORTORIUM

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LITERATURE CITED

- BATES, D. M. 1963. The genus *Malacothamnus*. Ph.D. thesis, University of California, Los Angeles.
- BORSSUM WAALKES, J. VAN. 1960. The typification of the genus *Malvastrum*. *Taxon* 9: 212-213.
- ELLIOTT, S. 1822. *Sida*. In A sketch of the Botany of South Carolina and Georgia 2: 159-162. J. R. Schenck. Charleston.
- EWAN, J. and N. EWAN. 1963. John Lyon, nurseryman and plant hunter, and his journal, 1799-1814. *Trans. Am. Philos. Soc.*, n. ser. 53(2): 1-69.
- FERNALD, M. L. 1939. New species, varieties and transfers. *Rhodora* 41: 423-461.
- GRAY, A. 1849. *Malvaceae*. In *Plantae Fendlerianae Novi-Mexicanae*. *Mem. Am. Acad.*, ser. 2, 4: 15-25.
- . 1897. *Malvastrum*. In *Synoptical Flora of North America*. 1(1): 308-313.
- GREEN, M. L. 1935. In *International Rules of Botanical Nomenclature*, ed. 3. p. 145. Gustav Fischer, Jena.
- HOOKE, W. J. 1834. Notice concerning Mr. Drummond's collections, made chiefly in the southern and western parts of the United States. *Journ. Bot. Hooker* 1: 183-202.
- JONES, G. N. and G. D. FULLER. 1955. *Malvastrum*. In *Vascular Plants of Illinois*. p. 322. University of Illinois Press, Urbana.
- KEARNEY, T. H. 1935. The North American species of *Sphaeralcea* subgenus *Eusphaeralcea*. *Univ. Calif. Pub. Bot.* 19: 1-128.
- . 1947. Type of the genus *Malvastrum*. *Leafl. West. Bot.* 5: 23-24.
- . 1950. Notes on *Malvaceae*. *op. cit.* 6: 51-52.
- . 1951. The American genera of *Malvaceae*. *Am. Midl. Nat.* 46: 93-131.
- . 1955. *Malvastrum* A. Gray — a re-definition of the genus. *Leafl. West. Bot.* 7: 238-241.
- KRAPOVICKAS, A. 1949. Las especies de "*Sphaeralcea*" de Argentina y Uruguay. *Lilloa* 17: 179-222.

- . 1951. *Monteiroa*, nuevo género de Malvaceae. Bol. Soc. Argent. Bot. **3**: 235-244.
- . 1954. Estudio de las especies de "Anurum", nueva sección del género "Urocarpidium" Ulbr. (Malvaceae). Darwiniana **10**: 606-636.
- . 1957a. Números cromosómicos de Malváceas Americanas de la tribu *Malveae*. Rev. Agron. Noroeste Agr. **2**: 245-260.
- . 1957b. Las especies de *Malvastrum* sect. *Malvastrum* de la flora Argentina. Lilloa **18**: 181-195.
- MOHR, C. 1901. *Malvastrum*. In Plant life of Alabama. Contr. U.S. Nat. Herb. **6**: 616.
- PURSH, F. 1814. *Sida* and *Malva*. In Flora Americae Septentrionalis. **2**: 452-454.
- ROY, R. P. and R. P. SINHA. 1961. Meiotic studies in some malvaceous species. Curr. Sci. Bangalore. **30**: 26-27.
- RYDBERG, P. A. 1932. *Sidopsis*. In Flora of the Prairies and Plains of Central North America. p. 541. New York Botanical Garden, New York.
- SCHREBER, J. C. D. VON. 1791. *Sida* and *Malva*. In Genera Plantarum. **2**: 463, 466. Francofurti ad Moenum.
- SKOVSTED, A. 1935. Chromosome numbers in the Malvaceae. I. Jour. Genetics **31**: 263-296.
- . 1941. Chromosome numbers in the Malvaceae. II. Compt. Rend. Lab. Carlsb. Physiol. **23**: 195-242.
- STEYERMARK, J. A. 1963. *Sphaeralcea*. In Flora of Missouri. p. 1050. Iowa State University Press, Ames.